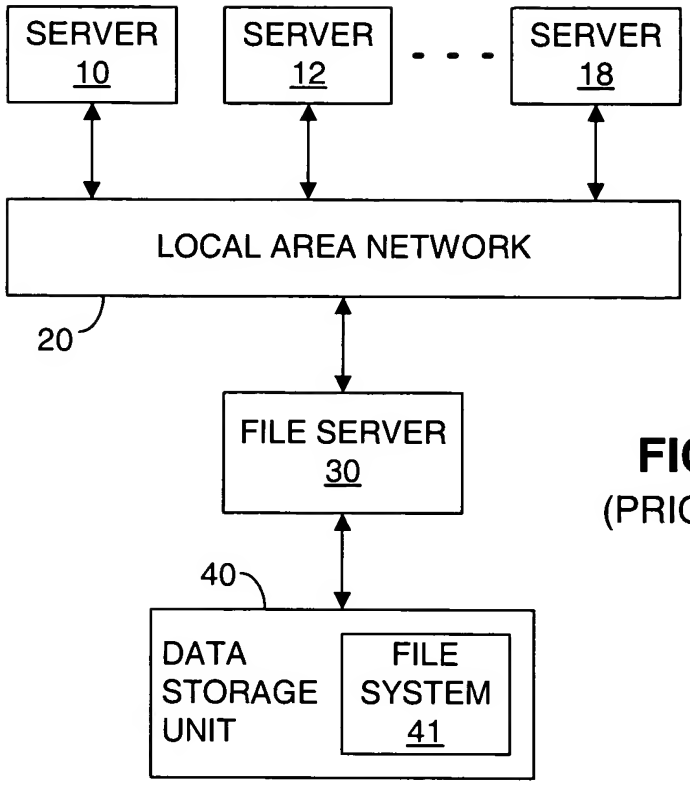

FIG. 1A
(PRIOR ART)

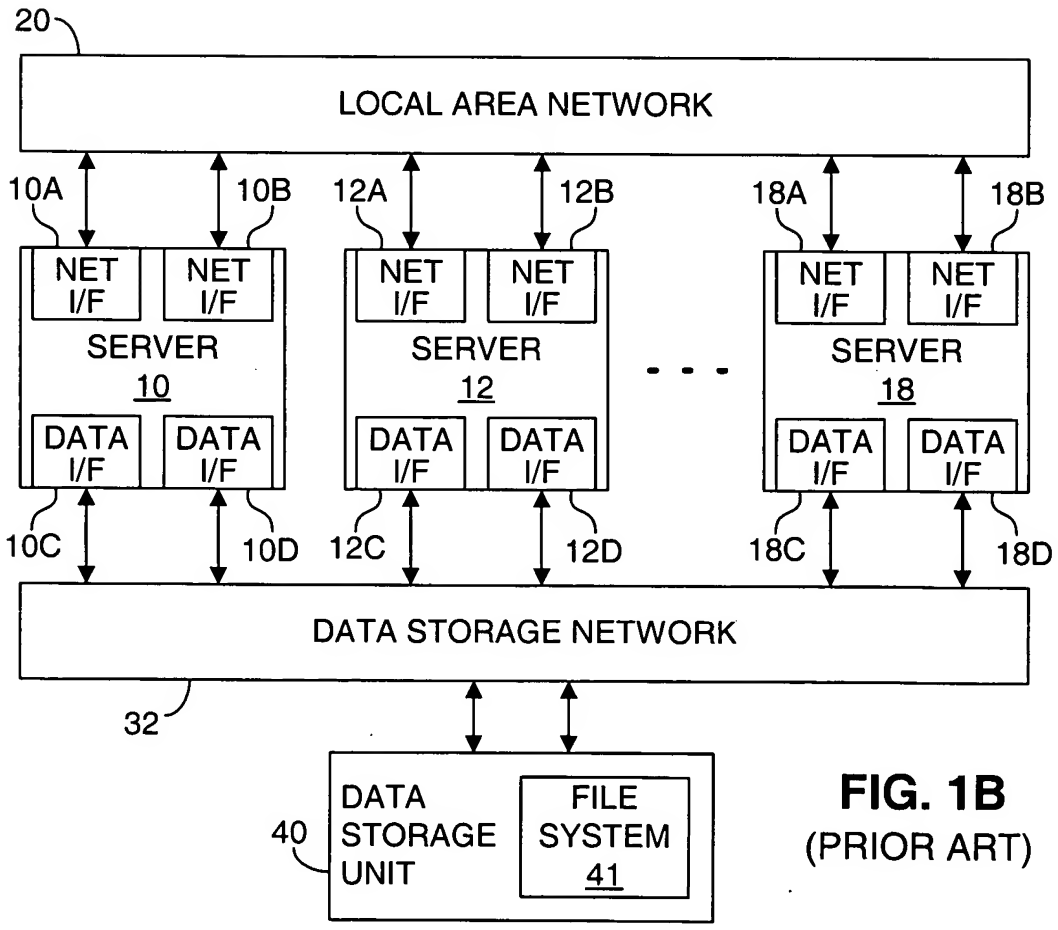

FIG. 1B
(PRIOR ART)

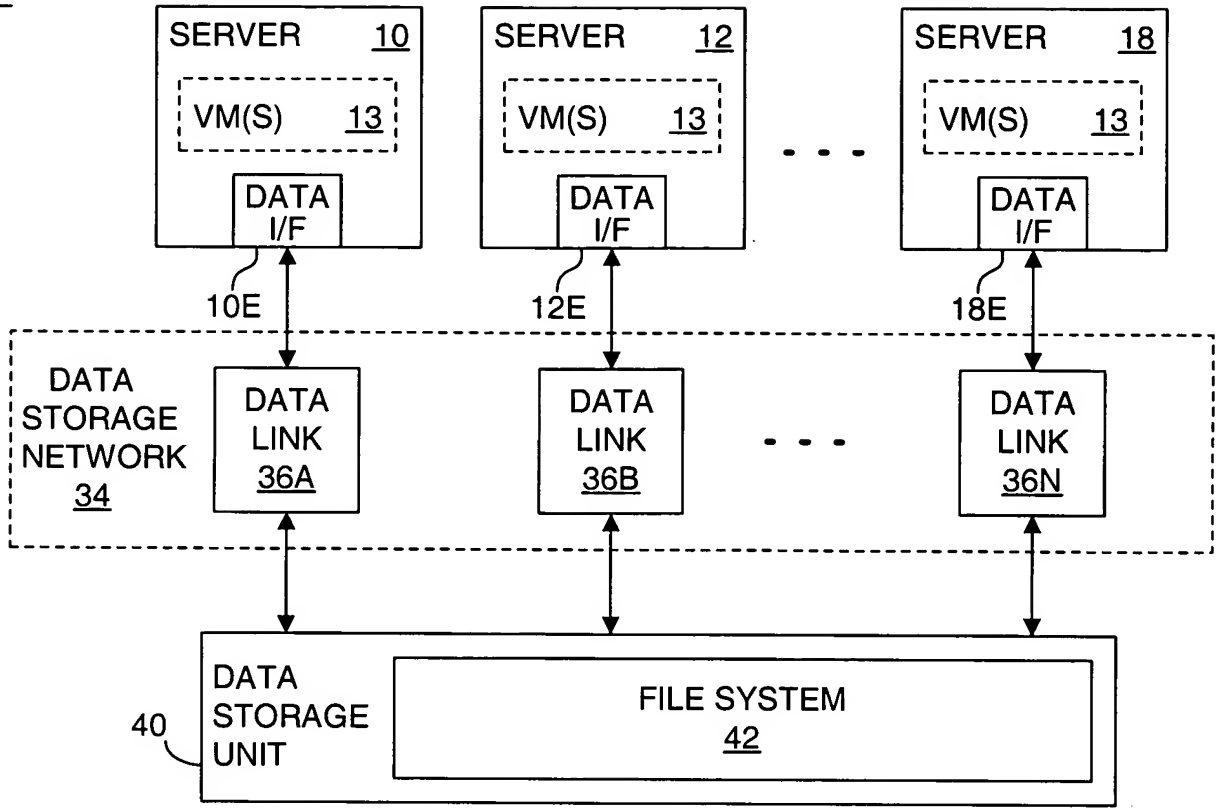
SERVER 10
VM(S) 13
DATA I/F
SERVER 12
VM(S) 13
DATA I/F
SERVER 18
VM(S) 13
DATA I/F
10E
12E
18E
DATA STORAGE NETWORK 34
DATA LINK 36A
DATA LINK 36B
DATA LINK 36N
DATA STORAGE UNIT
40
FILE SYSTEM 42

FIG. 2

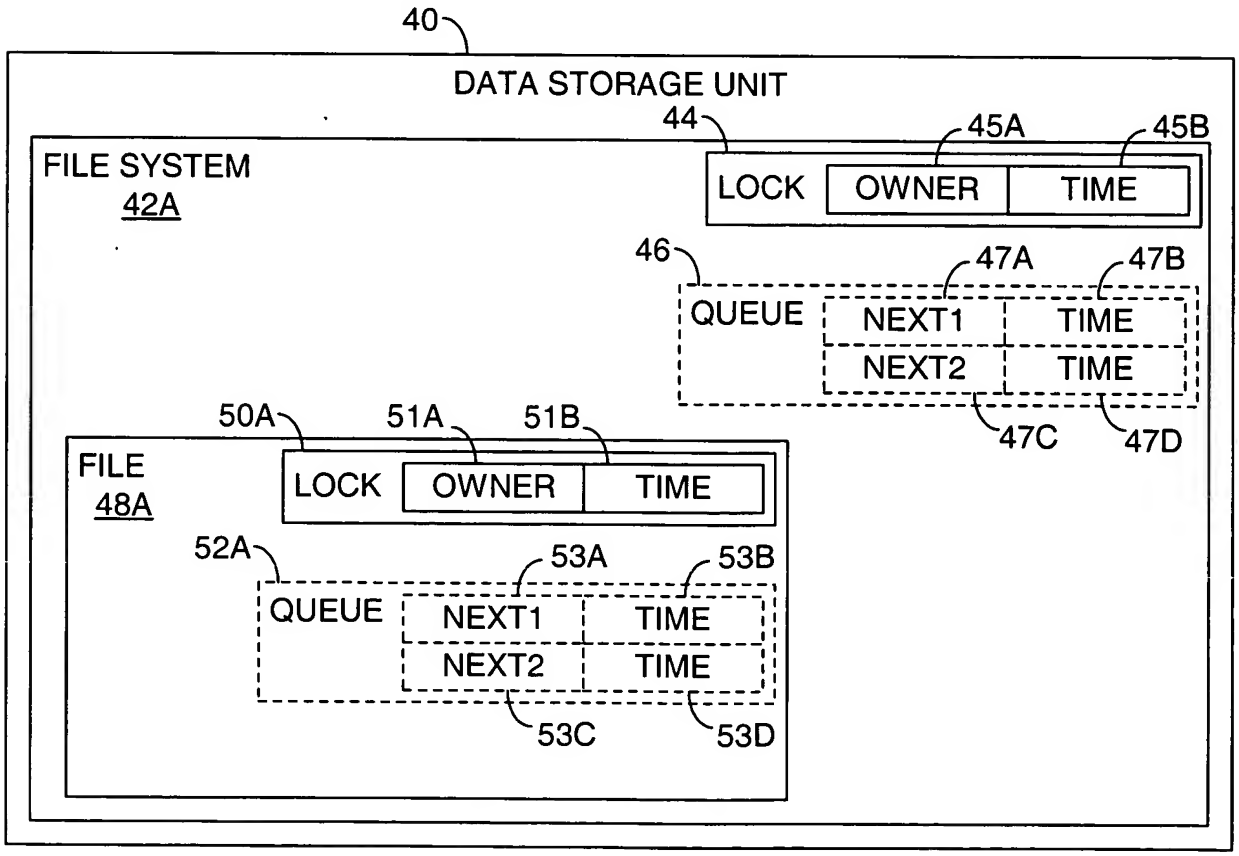
40
DATA STORAGE UNIT
44
45A
45B
FILE SYSTEM 42A
LOCK
OWNER
TIME
46
47A
47B
QUEUE
NEXT1
TIME
NEXT2
TIME
47C
47D
50A
51A
51B
FILE 48A
LOCK
OWNER
TIME
52A
53A
53B
QUEUE
NEXT1
TIME
NEXT2
TIME
53C
53D

FIG. 3

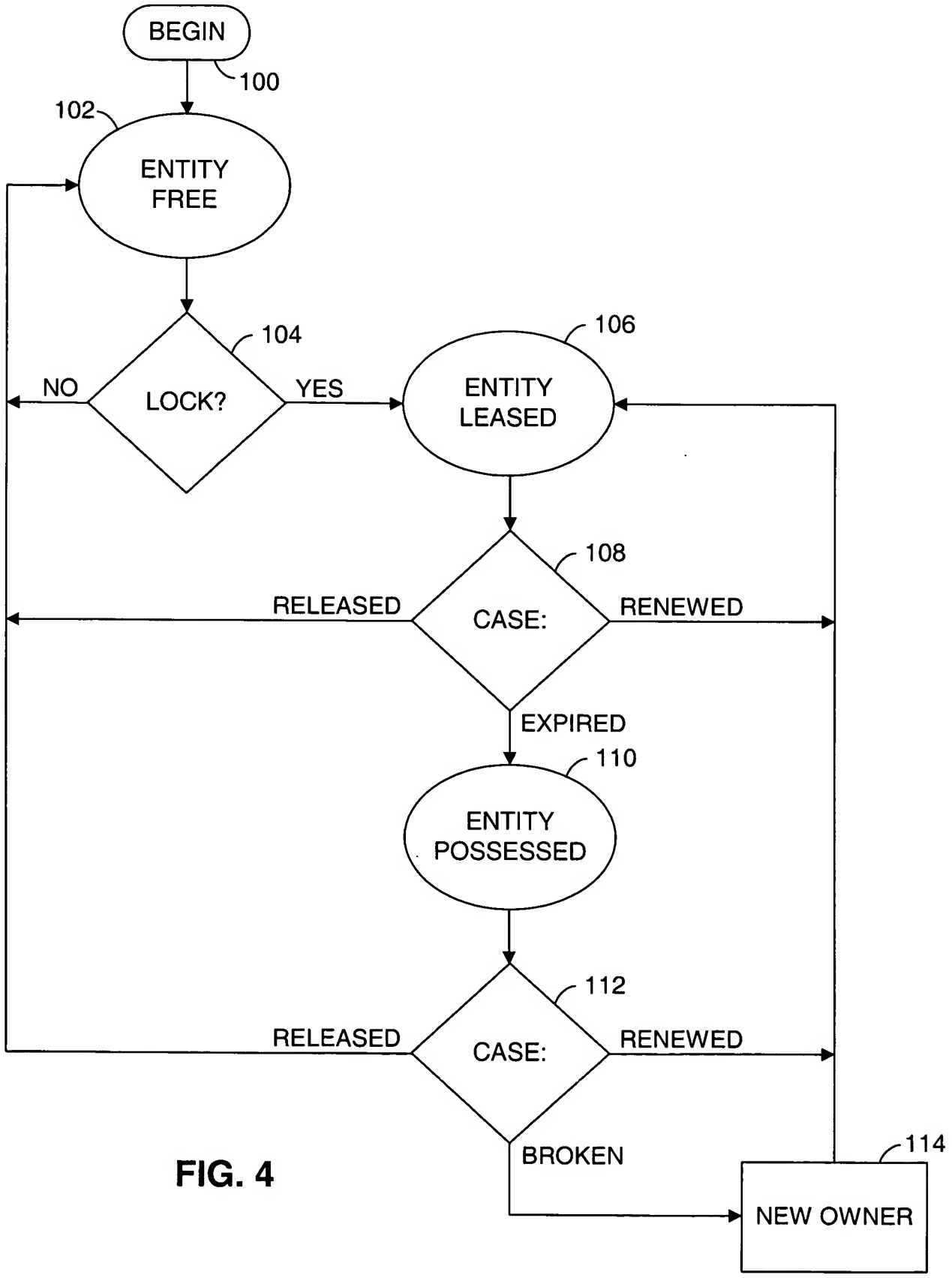
BEGIN
100
102
ENTITY FREE
104
LOCK?
NO
YES
106
ENTITY LEASED
108
CASE:
RELEASED
RENEWED
EXPIRED
110
ENTITY POSSESSED
112
CASE:
RELEASED
RENEWED
BROKEN
114
NEW OWNER

FIG. 4

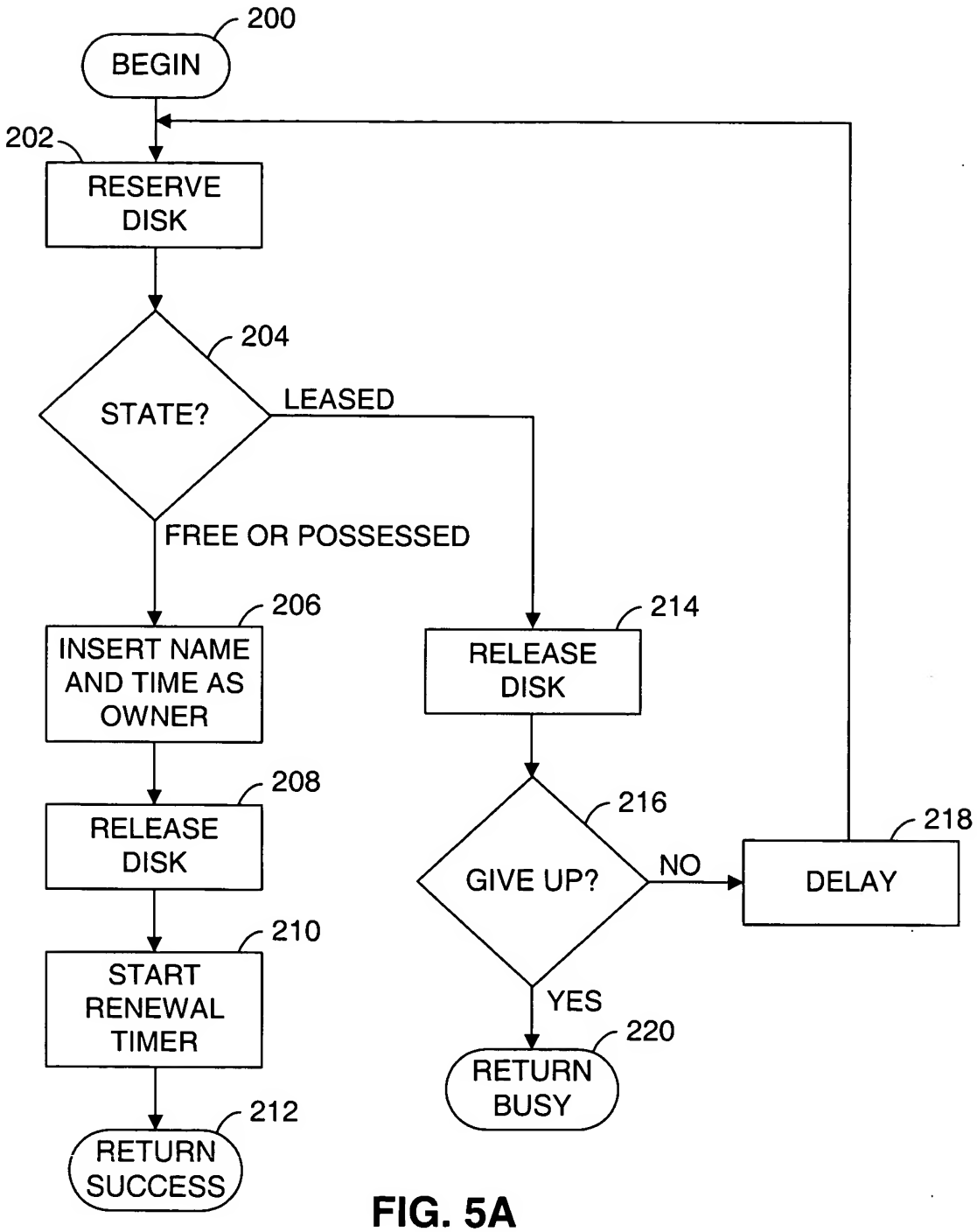
200
BEGIN
202
RESERVE DISK
204
STATE?
LEASED
FREE OR POSSESSED
206
INSERT NAME AND TIME AS OWNER
208
RELEASE DISK
210
START RENEWAL TIMER
212
RETURN SUCCESS
214
RELEASE DISK
216
GIVE UP?
NO
YES
218
DELAY
220
RETURN BUSY

FIG. 5A

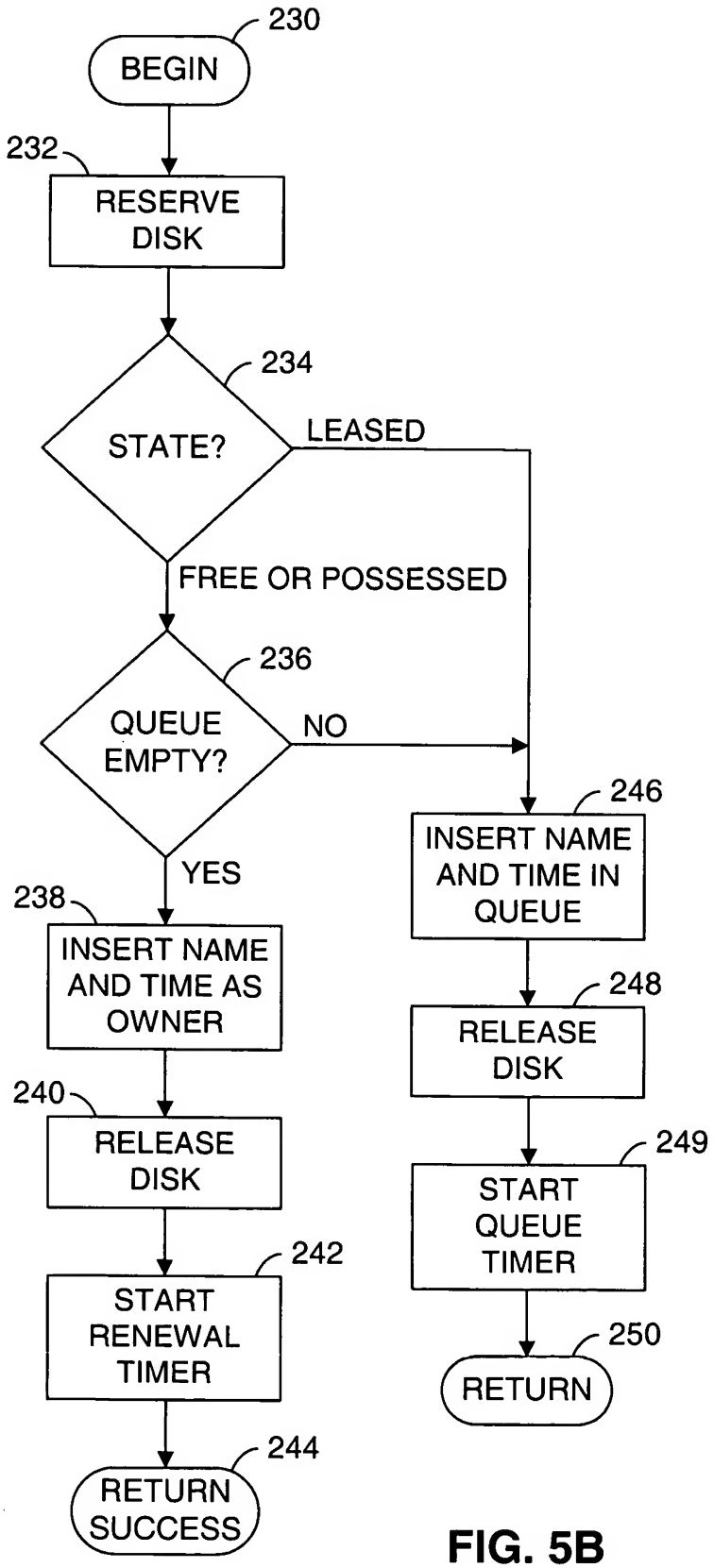
230
BEGIN
232
RESERVE DISK
234
STATE?
LEASED
FREE OR POSSESSED
236
QUEUE EMPTY?
NO
YES
246
INSERT NAME AND TIME IN QUEUE
238
INSERT NAME AND TIME AS OWNER
248
RELEASE DISK
240
RELEASE DISK
249
START QUEUE TIMER
242
START RENEWAL TIMER
250
RETURN
244
RETURN SUCCESS

FIG. 5B

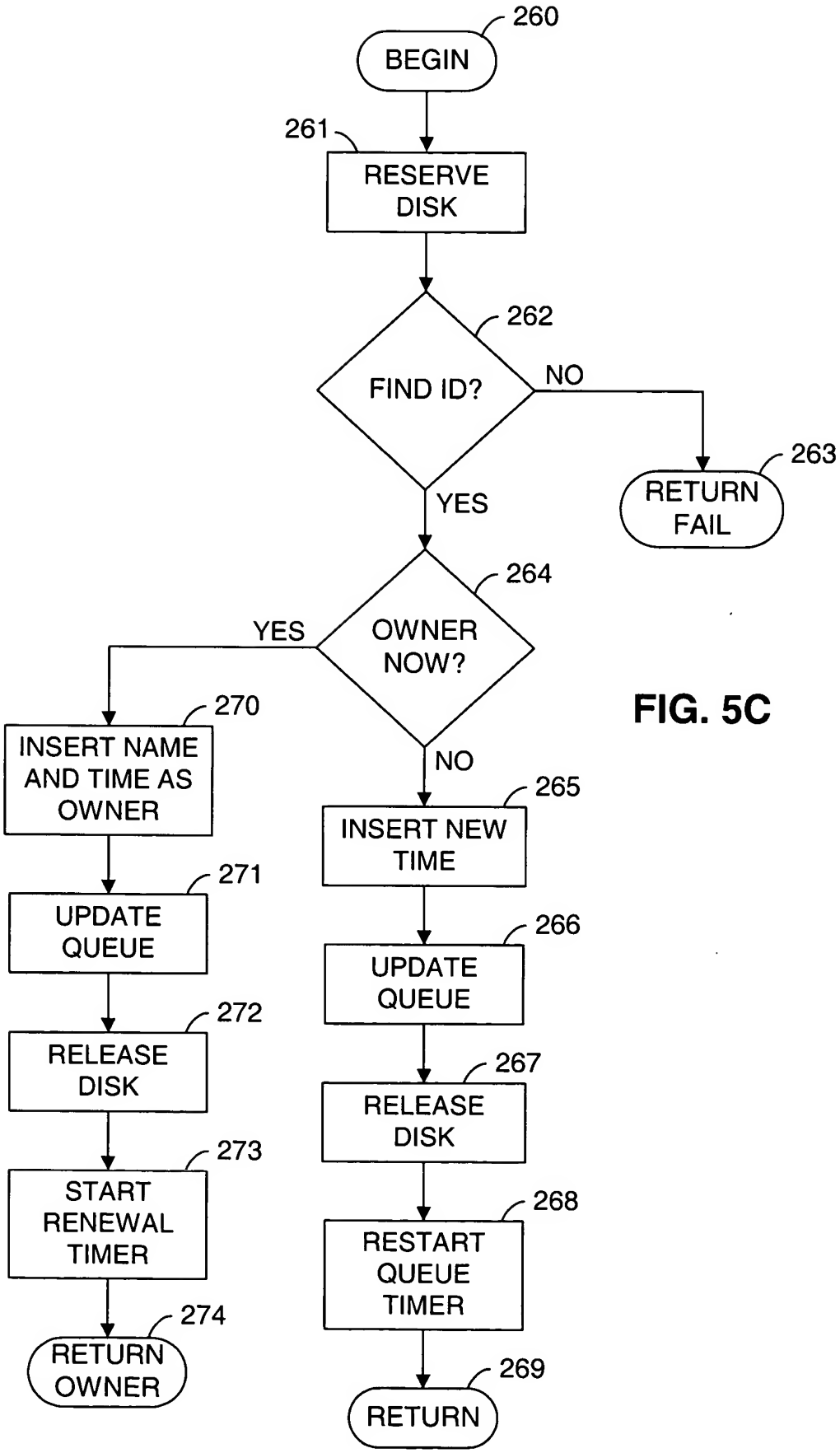
260
BEGIN
261
RESERVE DISK
262
FIND ID?
NO
263
RETURN FAIL
YES
264
OWNER NOW?
YES
NO
270
INSERT NAME AND TIME AS OWNER
271
UPDATE QUEUE
272
RELEASE DISK
273
START RENEWAL TIMER
274
RETURN OWNER
265
INSERT NEW TIME
266
UPDATE QUEUE
267
RELEASE DISK
268
RESTART QUEUE TIMER
269
RETURN

FIG. 5C

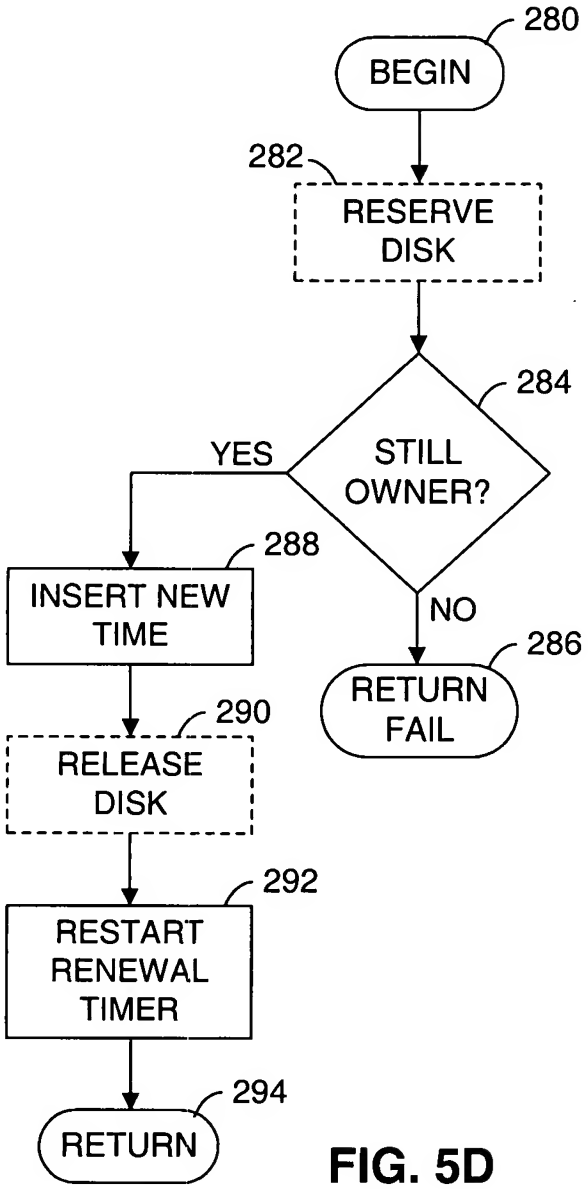
280
BEGIN
282
RESERVE DISK
284
STILL OWNER?
YES
NO
288
INSERT NEW TIME
286
RETURN FAIL
290
RELEASE DISK
292
RESTART RENEWAL TIMER
294
RETURN

FIG. 5D

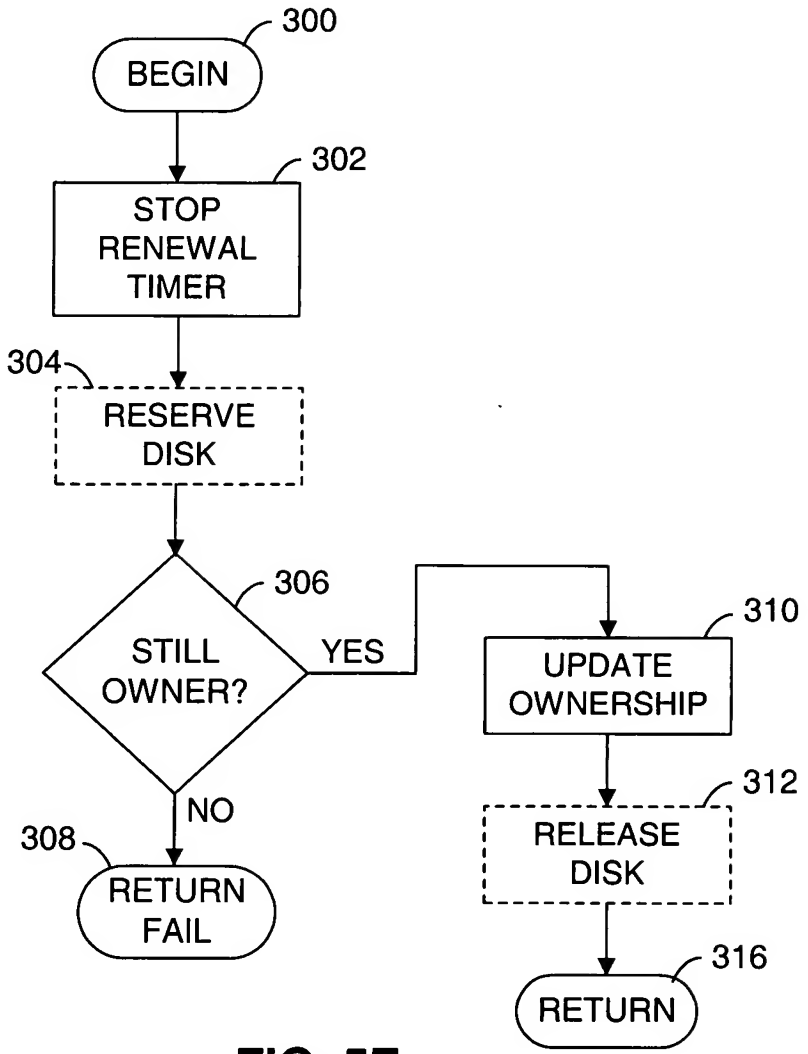
300
BEGIN
302
STOP RENEWAL TIMER
304
RESERVE DISK
306
STILL OWNER?
YES
NO
308
RETURN FAIL
310
UPDATE OWNERSHIP
312
RELEASE DISK
316
RETURN

FIG. 5E

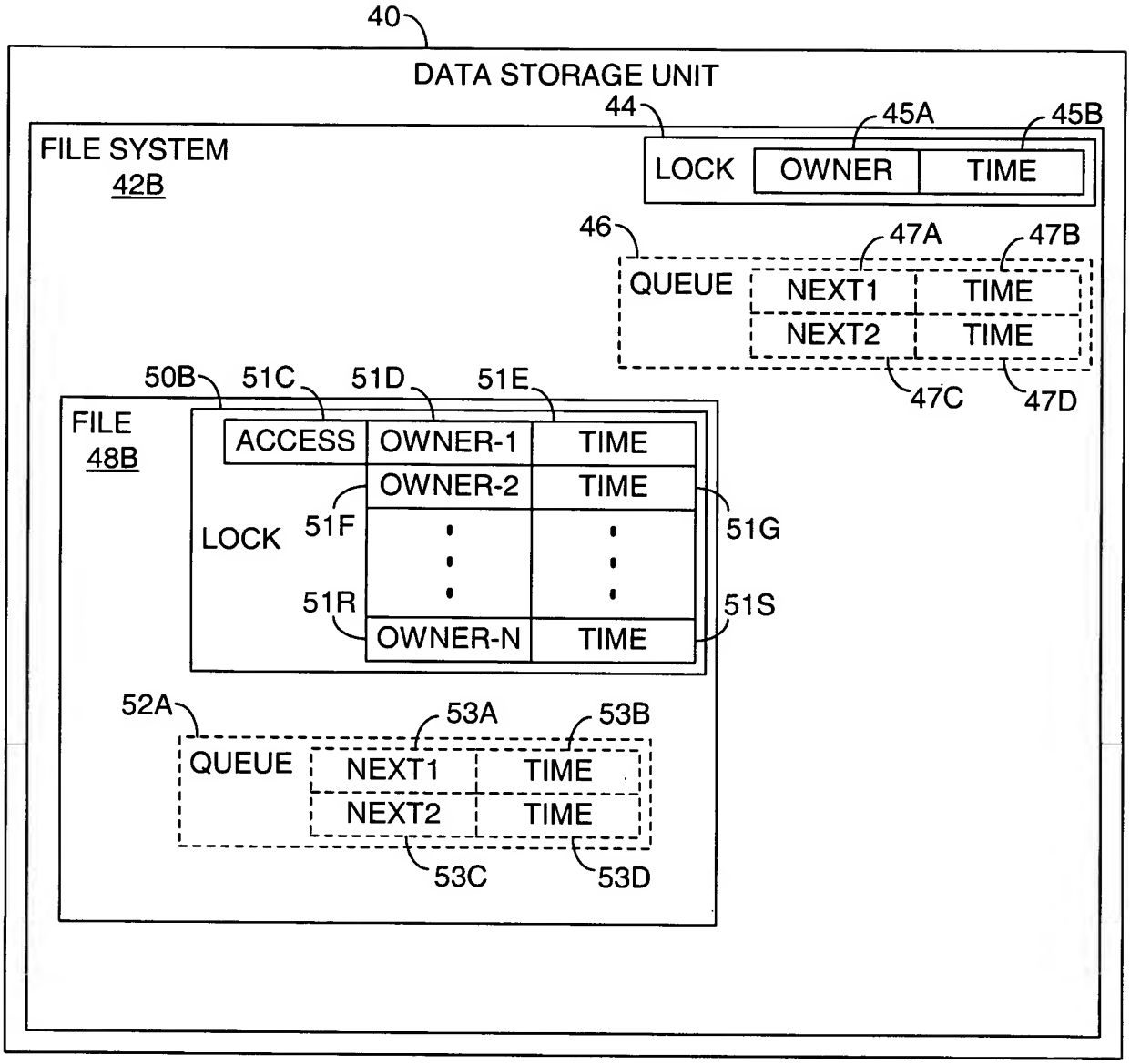
40
DATA STORAGE UNIT
44
45A
45B
FILE SYSTEM
42B
LOCK
OWNER
TIME
46
47A
47B
QUEUE
NEXT1
TIME
NEXT2
TIME
47C
47D
50B
51C
51D
51E
FILE
48B
ACCESS
OWNER-1
TIME
OWNER-2
TIME
LOCK
51F
51G
51R
51S
OWNER-N
TIME
52A
53A
53B
QUEUE
NEXT1
TIME
NEXT2
TIME
53C
53D

FIG. 6A

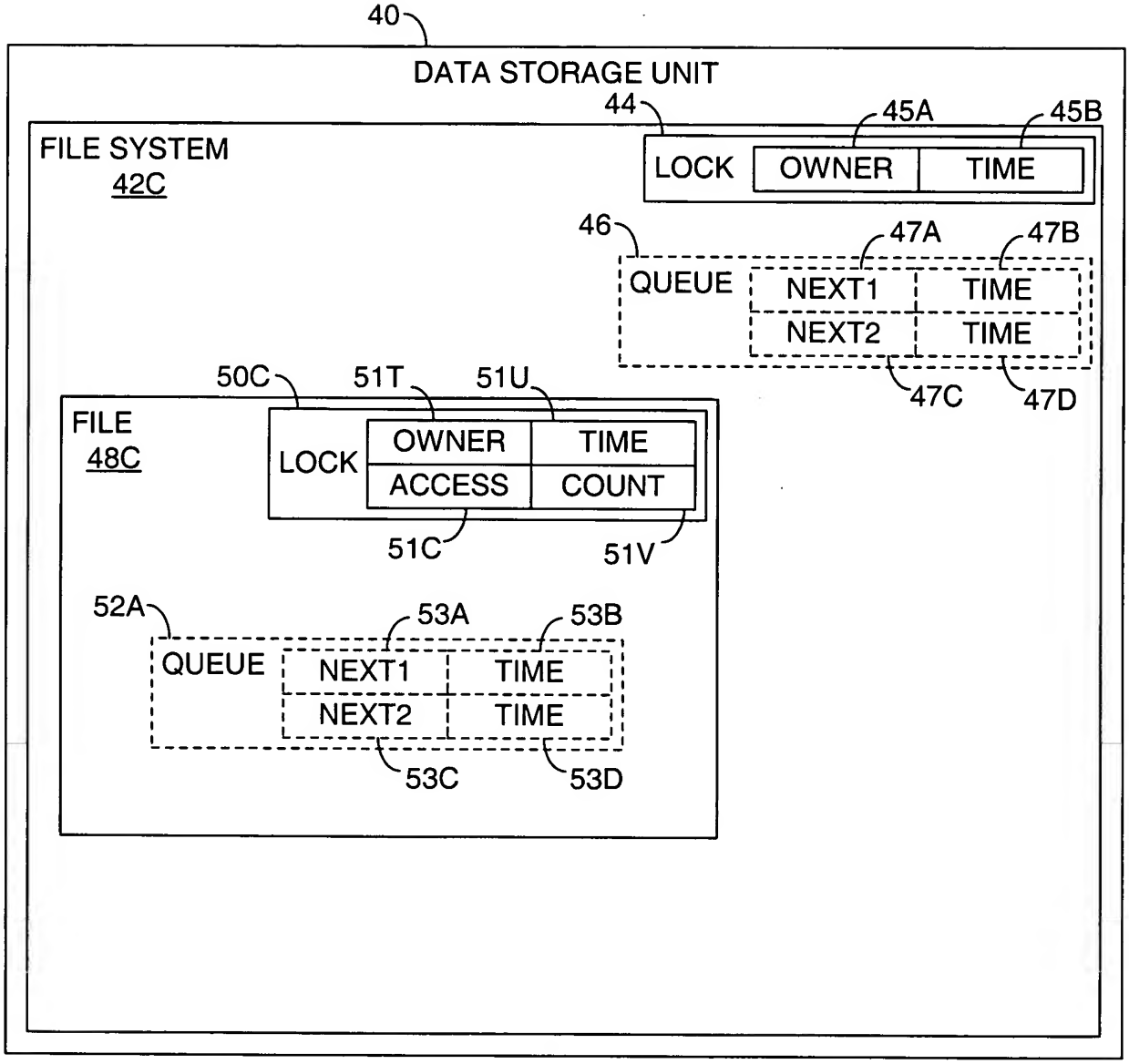
40
DATA STORAGE UNIT
44
45A
45B
FILE SYSTEM
42C
LOCK
OWNER
TIME
46
47A
47B
QUEUE
NEXT1
TIME
NEXT2
TIME
47C
47D
50C
51T
51U
FILE
48C
LOCK
OWNER
TIME
ACCESS
COUNT
51C
51V
52A
53A
53B
QUEUE
NEXT1
TIME
NEXT2
TIME
53C
53D

FIG. 6B

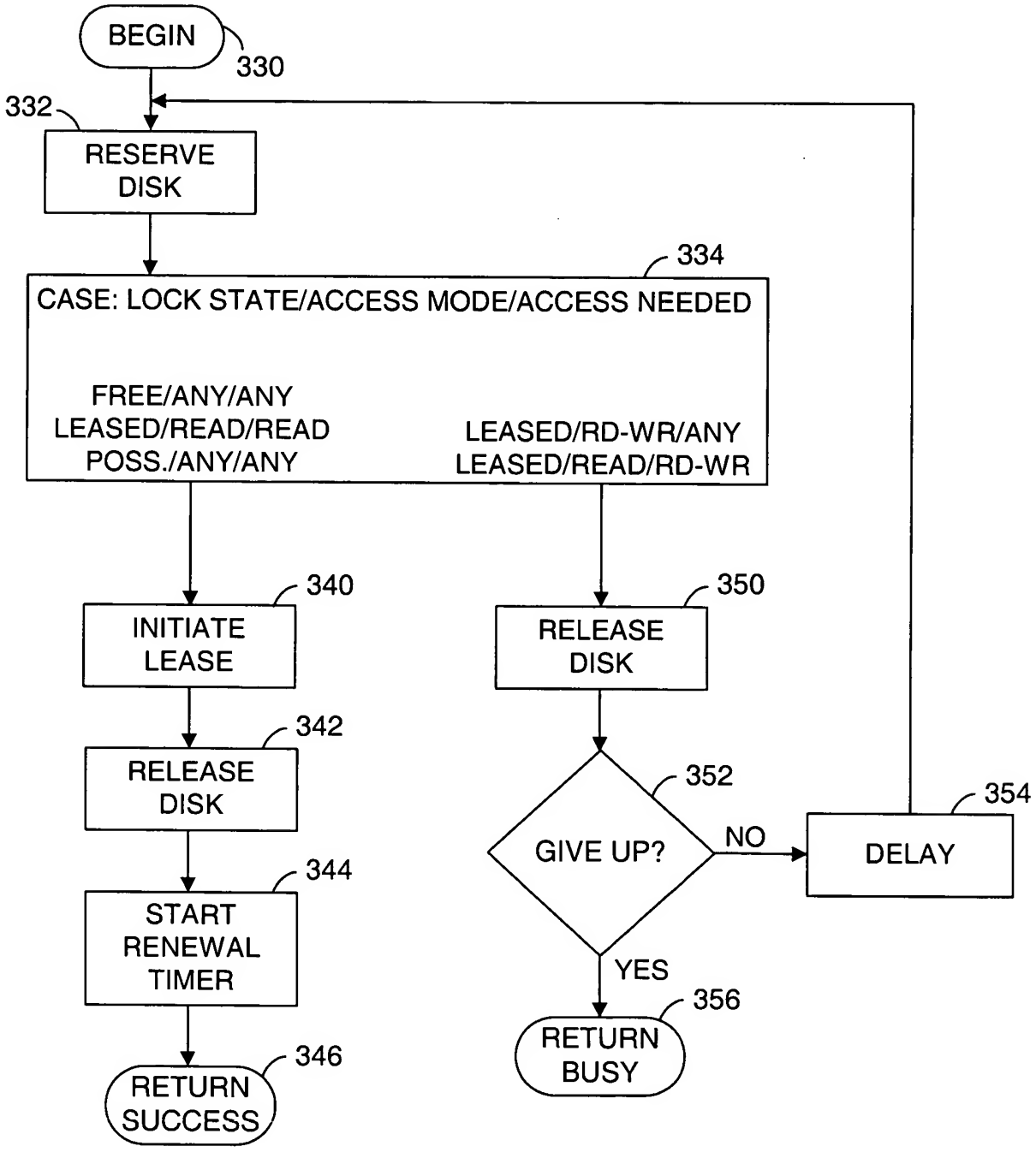
BEGIN
330
332
RESERVE DISK
334
CASE: LOCK STATE/ACCESS MODE/ACCESS NEEDED
FREE/ANY/ANY
LEASED/READ/READ
POSS./ANY/ANY
LEASED/RD-WR/ANY
LEASED/READ/RD-WR
340
INITIATE LEASE
342
RELEASE DISK
344
START RENEWAL TIMER
346
RETURN SUCCESS
350
RELEASE DISK
352
GIVE UP?
NO
354
DELAY
YES
356
RETURN BUSY

FIG. 6C